BLAST LOADING AND STRUCTURAL DAMAGE IN AN INTERNAL CORNER

RITZEL,E.V.;SLATR,J.E.;THIBAULT,P.A.

Structural configurations involving features such as internal corners or confined spaces can cause significant blast loading enhancement leading to damage which might not have been expected otherwise. This is due to non-linear shock interactions which can easily amplify the free-field overpressure by an order of magnitude. The internal corner problem is an important one for may structures vulnerable to blast, and several studies by different agencies have been conducted in the past for targets ranging from aircraft to hydro-dams. For the present study, the entire problem of load amplification and resultant damage due to blastwave entry into a 90-degree internal corner was analyzed by numerical methods ranging from sim-plistic to advanced. The results of these computational methods for blast loading and structural response have been compared to experimental data obtained from a large-scale blast test on a stiffened steel panel representative of naval warship design. This study, which employed a range of methods, has allowed an assessment of the trade-off between computational effort and accuracy.

The particular case taken for this study was based on an experiment conducted at the MISTY PICTURE 4800-ton ANFO blast test. AN instrumented 4.6m by 2.4m stiffened steel naval bulkhead was configured in a corner and subjected to a 345 kPa incident blast, severely damaging the panel. In the post-test analyses, blast loading methods were employed including simple amplification factor, semi-analytical response was solved by single-degree-freedom, simplified finite-element, and advanced finite-element
(ADINA) methods.